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This industry is carried on in the town of Adorf, where many hundreds of thousands of mussels are worked up annually. If it were not for raw material received from other parts of Europe the Saxon beds would soon be depopulated. A similar manufacture has sprung up in parts of Bohemia and Bavaria. Naturally other sorts of pearl shell are worked up in the same shops, especially *Haliotis iris* Chemn., from New Zealand, and *Turbo marmoratus* L., from the East Indies; *Turbo pica* L., from the West Indies and the Californian "abalones," *Haliotis cracherodii*, *splendens* and *rufescens*.

Japan produces some small but brilliant pearls from her fresh-water mussels, *Cristaria spatiosa* and *Anodonta japonica*, especially the former.

In China the immense but thin-shelled *Dipsas plicatus* is made use of to produce miracles by the monks of a Buddhist monastery at Pú sa ch'í p'ang. Small stamped tinfoil images of Buddha are slipped between the mantle and the shell at the front end of the animal, and it is then placed in an aquarium or tank. In two or three months they are covered by a coating of pearl which fastens them to the inside of the shell while the embossed features of the image stand out in relief. As many as twenty of these "miraculous" Buddhas are sometimes found on a single valve. The pious pilgrims, in ignorance of the means by which they are produced, consider this the highest testimony to the supernatural character and powers of the venerated founder of their sect, while the monastery reaps a handsome income from the same.

(*To be continued.*)

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ABORIGINAL QUARRIES—SOAPSTONE BOWLS AND THE TOOLS USED IN THEIR MANUFACTURE.

BY J. D. McGUIRE.

OF recent years soapstone quarries showing undoubted evidences of having been regularly worked by early American races, have been discovered in several of the States of the Union, and it is highly probable that they will be found wherever the soapstone itself is met with of a character suitable for being worked. The manner of working the quarries, the tools used in them, as well as the vessels there made are as yet comparative

novelties to our archæologists, and consequently but imperfectly understood. The specimens found in the quarries, as a rule, are bowls or dishes, although it is known that other articles were manufactured from this stone.

Quarries of soapstone, showing evidence of extensive working, and similar to those we find on the Atlantic seaboard, have been observed in California, and are described in the seventh volume of Wheeler's Survey by Paul Schumacher; although the California Indians made vessels of a different character to those with which we are familiar. It is suggested by Schumacher that the markings of metal tools were observed in the California specimens, though he does not mention the finding of any metal in the quarries. The same suggestion has been made in regard to those articles which we have in Maryland, because of the regular tool marks often observable on the bowls; so far, however, as the remark refers to our bowls, I believe it to be erroneous; primarily because I have seen no indications of the use of metal, not having found a trace of it in my researches, but principally because I have implements of stone, found in the quarries, with which the whole work was capable of being performed. These implements are all of stone, and I feel satisfied that the quarries themselves belong to the pure stone age; Kalm, the Swede, who visited this country early in the last century, describes pot-stone dishes as being made by Indians "notwithstanding their unacquaintance with metals." Although we have no present data by which to demonstrate the antiquity of our quarries, I think we have sufficient evidence to justify our belief that they certainly date to a time prior to the advent of the whites, still they must have been worked up to and within the historic period. According to the opinion of those who composed the expedition of which Schumacher was the chief, the California Indians do not appear to have possessed the art of manufacturing vessels of clay; or if they did, it was to a very limited extent. In Maryland, on the contrary, there is abundant evidence that pottery and soapstone were used at the same time and by the same people, for broken soapstone dishes, or bowls, have been found on village sites, and also in the shell heaps associated with pottery.

The area and development of these quarries seem so extensive, the regularity observed in the shape of the tools in the different quarries, and also in the shape of the dishes, seems so

uniform that one is almost persuaded that these quarrymen, if I may so term them, were skilled artisans.

The Indians of California are said to have traded *ollas* for those things which they stood most in need of, and is it not natural to suppose that the Indian of the East was less a trader than his western cotemporary ?

Whilst the dishes do not appear to be difficult to manufacture, so far as mere labor is concerned, there is a certain sameness observable in the tool marks, both inside and outside the bowls, that would hardly be met with were they made by untaught workmen. The same may be said of the tools themselves, most of which I have found to be regularly grooved and peculiarly adapted to the work required of them.

Quarries showing undoubted indications of aboriginal occupation have been several times described ; their extent, the character of stone worked, the shape of the dishes, &c., so that I shall confine my remarks as much as possible to that which has struck me as being of interest and novel in those remains.

It has been but a few years since the first of these quarries became known, and their examination thus far has been confined almost entirely to what could be found upon the surface, such as bowls, dishes or other large objects ; and but little time has been devoted to anything like a systematic examination, which, if made, could hardly fail of interesting and valuable results.

Frank Cushing, under auspices of the Smithsonian, opened one quarry at Chula, in Virginia, and others are known to exist in Connecticut, Massachusetts, Pennsylvania, Rhode Island, New Jersey, Maryland, District of Columbia, Virginia and North Carolina, and all have, I believe, been discovered within the past decade. Those thus far examined seem to have been devoted solely to the manufacture of articles intended for culinary purposes. Whereas the *olla* of California, whatever its real use, seems best adapted for holding liquids for the purpose of being transported a distance, or for storage purposes, thus taking the place of pottery. Whilst the *olla* of California is better finished than our dishes, which, as is well known, are rude when found in quarries, they all appear to have been taken from graves. Articles of soapstone found in the East, on the contrary, are almost exclusively surface finds in abandoned quarries, and so far as I am aware no finished dishes have ever been discovered. It is to

be hoped that finished specimens will be discovered, for we know they were made, and it is singular they have not been found. Soapstone bowls are heavy, rough, take up much space, and because of their great weight are often left behind by field parties. I have found four or five small pieces of soapstone vessels several miles from any known working place, or vein of the stone, and invariably these small pieces show tool marks finer than any that we have as yet discovered in the quarries; some even are smoothed; and pieces have been found with rough attempts at ornamentation. Judging from the number of working places or quarries, and the numbers of broken vessels occurring in them, soapstone must have been extensively used; this use, however, must have been confined within comparatively contracted limits, because of the great weight of the material, unless when near water transportation.

In Maryland, so far as I have observed, the process of making soapstone vessels in quarries, the "pot-forms" seem to have been first taken from the living rock, in a block of a suitable size for the desired vessel. This form or block was obtained by picking a groove on the bed rock and deepening this groove to the desired depth, when it was wedged loose after being cut under as far as possible. The outer lines of the intended dish were then cut on the form which was as yet as solid as it was when detached from the quarry rock, and this cutting was done with a bladed implement. These outside strokes of the tool are almost as bold as if they had been given with an implement of metal, often a chip three inches or more in length being taken from the bowl at a stroke. Almost all the bowls show this cutting process to have been followed and not the pecking or picking so often described as the manner of forming the bowl on bed rock. The handles to these dishes as a rule do not show the same bold stroke we generally find on the body of the bowl, and this I imagine to be because the handles would probably be injured by any such severe usage, they were cut more delicately, and generally show finer tool marks.

After the outer shape was thus given the bowl, the inner side of the vessel was commenced, and here we find picking again to have been resorted to as when the outer form was first started on bed rock; first a groove just inside the rim of the intended vessel was formed by pecking with a sharp-pointed tool, and the

core thus left must have been detached with a cutting tool, probably used as an adze. After the inner side was thus formed, I am inclined to think a tool somewhat on the order of a chisel was employed, for we find many of the vessels with smooth cut inner sides which I suppose to be secondary cuttings. I have found celts in different quarries with ground edges only, which I am satisfied were used in the quarry preparation of the vessels.

The tools used in quarrying and fashioning these dishes appear to me to be a class of implements entirely distinct from anything which we have heretofore seen or had described. Those sharply pointed and rounded quartz stones with sharp points and cutting edges found in most quarries, were possibly used as suggested by others, in the hands; but to my mind they are natural forms not generally used. Whereas the true quarry tools were mostly if not always hafted and grooved, roughly it is true, but distinctly. Their general shapes I might say are often almost identical with implements from the drift.

One thing very noticeable is the exceedingly rough and rude finish of the dishes found in the quarries, whereas their outlines as a rule are really symmetrical. Any one would, I think, be impressed with the want of finish in a collection of quarry specimens, but more especially is this the case when compared with those small pieces elsewhere alluded to, which we find in the fields. The former are exceedingly rough and thick, and the latter often smooth, always thin and delicate, and sometimes showing a rude ornamentation in the lines found cut on them.

To claim that these quarry specimens were used in anything like their present condition, supposing they were whole dishes, is unreasonable, because of our inability to imagine purposes for which they would have been serviceable. We find in the quarries, almost invariably, broken vessels which must be the failures of a manufactory. It will be asked, of course, where are the completed vessels? Whether cached or buried remains for the future to disclose. We know enough, however, to be able to say positively, the completed vessel does exist; but even then we know as yet but little of it in any condition. The worked surface of the rock in that quarry with which I am most familiar, varies from three to six feet beneath the present surface of the surrounding soil, and the quarry pits are indicated only by slight depressions in the ground, now hardly observable. This filling in of the pits

is of course caused by freezing and thawing of possibly centuries. On opening one of the pits the artificial character of the soil becomes manifest, consisting as it does of chips of the soapstone without number, from the size of a pea to that of one's fist, or even greater, mixed with the soil; with here and there a handle, a rim, or the bottom of a dish, and not unfrequently lost or broken tools. Rude evidences of a forgotten race, of whom all we know, or possibly can know, must be gleaned from these abandoned workshops.

The shape of these vessels varies greatly, though generally speaking they are oblong; some, though, are round and some almost rectangular. They are from an inch to seven or eight deep, and from three to fifteen or eighteen inches long. Whilst some of these were small drinking cups that would have held a gill or so, or were possibly children's toys, others were sufficiently large to hold a gallon or more. Almost invariably these dishes are supplied at the ends with handles coming straight out an inch or two from the body of the bowl. The only explanation of the absence of finished specimens in the quarries that appears to me at all plausible, is, that in the quarries the bowl was only blocked out in the rough, and was left to be completed at the owner's leisure in his home, where ornamentation and finish could be given according to the skill or taste of the individual possessor. The outline being once formed, and the superfluous weight removed in the quarry, the vessel could be carried with comparative ease, though some of the specimens are extremely heavy even then, and some that I have seen must weigh as much as fifty or more pounds, and could not have been transported any great distance from where they were manufactured, except with a greater exertion of strength than was probably ever made. To finish a dish as they were certainly sometimes finished—with delicate sides, smooth polish and rude ornamentation on the outer side—hardly required the same skill as was necessary in giving the bowl its original shape. It is highly probable that the quarry people used finished specimens in or near the quarries, and I trust that when further research is given the subject some of them may be found; but it is of course possible that these quarries were only visited by those who were in search of vessels intended for their own use, and they being fashioned to suit the taste of the individual, were again abandoned; but this suggestion I do not think probable,

although I believe it is related that such was the custom of those who manufactured the Catlinite pipes.

I have found two quarries in Maryland in which the manufacture of soapstone articles seems to have been regularly and systematically conducted, one in Howard and the other in Baltimore county. In many other places in these counties, and also in Carrol, where soapstone crops out, I have found rude vessels which possibly may have come from workings that have escaped my search. On the property in Howard, where one of these quarries is situated, I found, at my first visit, the whole surface of a large tract of woodland, possibly ten acres in extent, almost covered with broken dishes and bowls, with a few implements lying scattered here and there. The rock here crops out in certain places, but a dozen or more circular or elliptical depressions show where either a detached cobble had been worked out or a pit had been sunk to bed rock. For in this place I think both cobbles and bed rock have been worked for the purpose of manufacturing soapstone vessels. In the Baltimore county quarry only the solid beds of stone have been worked; this quarry has produced the best specimens of dishes which I have seen, and is now being worked for commercial purposes. In clearing away the surface soil in order to reach merchantable stone, many interesting specimens both of tools and dishes, or bowls, have been found, but I regret to say that many more have again probably been covered up, because of their value not being recognized by those working the quarry. In this place I have found most of the quarry tools which I now possess, and a sufficient number, I think, to give one a tolerably fair idea of the character of implement used in quarrying and manufacturing soapstone bowls. Here there do not appear to have been more than two or three pits worked, and they are not very extensive, although great numbers of pots must have been here made. The quarry tools appear to have been generally composed of black granite, with an occasional one of limestone or clay slate. Whilst quartz is common in the vicinity of soapstone, and its cleavage of a character to lead one to suppose that it would be generally used for making tools, I do not believe such to have been the case, although in all the descriptions I have read of soapstone quarries, quartz is said to have furnished most of the tools discovered, consequently I may be mistaken. Again quartz is exceedingly brittle, and I hardly think would stand the

constant battering requisite to detach a block from the quarry, or to fashion a bowl; while black granite on the other hand is one of the toughest of stones, and will stand a great amount of work without any appreciable wear. I believe many of these granite tools to have been overlooked because of their great resemblance to soapstone, either when lying on the ground or in the débris. The black granite crops out immediately above both of the quarries mentioned, and within a few feet of them. The quarry tools are of various shapes, and have several features I do not remember to have seen described. Some few are delicate, but the majority of them are exceedingly rough in appearance, and are peculiarly adapted to the work they had to perform. The tools, so far as I can describe them, consist of picks, mauls, axes, both single and double bladed, adzes, celts and chisels. The mauls, adzes, axes, and picks were generally grooved, many of them roughly and indistinctly, and were evidently intended to be used with handles. In fact, one of the men working in the present quarry, who had never suspected the use made of these tools, pointing to a roughly ground turtle-backed pick, now in my collection, said that when they dug it out of the bank it had a handle attached to it, which was made of a forked stick that was wrapped around it, and the ends tucked in the crotch of the stick. The names by which I call these tools are meant only as descriptive of those uses to which they appear to have been put, judging from their shape, and not that they were necessarily used as are the tools to which I liken them. There are some few implements, however, that have shapes which appear unique, and can be compared to no implement now used by white people, with which I am acquainted. The mauls appear to have been used in battering hard substances, and are greatly worn on their ends. The axes have blades flaked out symmetrically, and were many of them double ended, as in fact is quite a common occurrence among several of the quarry implements, the cutting edges are quite sharp, and would be capable of performing good work, although they are not ground. The picks were generally sharp-pointed and quite heavy, and were grooved for handles, whereas there were often picks, long and narrow, ungrooved and having a distinct inward curve, intended apparently for pecking, for being used more as an adze, but even they, I imagine, would have performed quicker and more satisfactory work if hafted. The adzes appear to have been

used for cutting towards one, as are adzes with us, and some of them to have been so shaped as to have been peculiarly well adapted for cutting in the living rock for the purpose of detaching a mass of it for particular purposes, or for giving a shape prior to the article being detached.

Evans in his *Ancient Stone Implements* describes hatchets, or broadaxes, like a certain class of tools found at Cissbury, in England, in certain pits in the chalk, that resemble our soapstone quarry tools in several particulars. Whilst Evans seems inclined, judging from the shapes of these tools, to attribute them to the Neolithic age, it is only, as he says, because of finding associated with them one or two ground celts that they were not considered Palæolithic. Judging from our present quarry experience, these tools, whilst so ancient in shape, appear to be among the most recent of the tools used during the stone age, which almost staggers one's belief in palæolithic forms. It is very often most difficult to describe stone implements, and I have seen but few palæoliths, and therefore may be mistaken, but there is no doubt in my mind that implements identically similar in shape and material with cave or river-drift implements, are to be found on the surface and associated with polished articles of apparent recent date, and nowhere is this more strikingly illustrated than in the immediate vicinity of Washington city. These stones bear the same characteristics which we observe in implements found under circumstances denoting a great age, but are in localities which lead us to consider them as modern.

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ANNELID MESSMATES WITH A CORAL.

BY J. WALTER FEWKES.

THE occurrence of annelid tubes on the under surface of many specimens of the well-known coral, *Mycedium fragile* Dana, from several localities, led me to suspect that the relationship of the worms which inhabit them to the coral, was that of commensals. Similar instances have been described in other genera by those authors who have mentioned the coral galls. A fact which adds to the interest attached to this subject is, that in almost all cases where the annelid is found associated with the coral, it has modified the general shape of the *Mycedium* to